BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: IMSc. **SEMESTER: I**
BRANCH: CQEDS **SESSION: MO/2022**

SUBJECT: ED101 INTRODUCTORY ANALYSIS

TIME: 03 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates.

		Marks	CO
Q.1(a)	Define open set. Give an example of a non-empty set which is open and closed both. Justify your answer.	[2+3]	CO1
Q.1(b)	Prove that every convergent sequence is bounded. Is the converse true? Justify your answer.	[3+2]	CO2
Q.2(a)	Test the convergency for the series $\sum_{n=1}^{\infty} \frac{(-1)^n\sqrt{n}+1}{n^{\frac{3}{2}}}$.	[5]	CO2
Q.2(b)	State Rolle's theorem for the function of single variable $f(x)$, defined on $[a,b]$. Examine the validity of the theorem for the function $f(x) = 1-(x-1)^{\frac{2}{3}}$ on $[0,2]$.	[2+3]	CO3
Q.3(a)	Identify the point(s) of the discontinuity and the types of the discontinuity (if any) at those points for the function $f(x)$, defined on $[-1,1]$, as follows. $f(x) = [x+1]\sin\frac{1}{x}, x \in (-1,0)\cup(0,1)$ $= 0,$ otherwise where $[x]$ denotes the largest integer $\leq x$.	[5]	CO3
Q.3(b)	Find the values of a, b and c such that $lim_{x\to 0}\frac{a\,e^x - b\cos x + c\,e^{-x}}{x\sin x} = 2$.	[5]	CO4
Q.4(a)	Find the n^{th} order derivative of the function $y = \frac{x^2}{(x+2)(2x+3)}$.	[4]	CO4
Q.4(b)	If $y = e^{m\sin^{-1}x}$, show that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - (n^2+m^2)y_n = 0$. Hence find $y_n(0)$.	[3+3]	CO4
Q.5	Providing necessary information, sketch of the graph of the curve $x^3 + y^3 + 3xy = 0$.	[10]	CO5

::::::15/03/2023::::::M